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Influence of Supplemental Methionine on Growth Performance of Uda Lambs in a Semi-Arid Environment

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Abstract

A twelve week feeding trial was conducted to determine the effect of supplementing methionine on growth performance of lambs. A total of twelve growing lambs were randomly allocated to three dietary treatments containing graded methionine levels in a completely randomised experimental design. The animals were fed diets containing 0 (control), 2 and 4g/kg methionine. Results indicated significant differences (P<0.05) between treatment means in terms of feed intake and live weight changes. Animals fed diets containing 2g/ kg methionine were better (P <0.05) compared to other treatments in terms of feed intake and growth performance. It was concluded that 2g/kg methionine gave the optimum performance.

Key Words: Methionine, growth performance, lambs, semi arid environment

Introduction

Protein nutrition and utilization by ruminant animals involve amino acid metabolism and utilization. A primary difference between ruminant and non-ruminant species is that protein quality is dependent upon the availability of amino acids leaving the rumen rather than that in the ingested diet (Ledin, 2004).Studies have however shown that amino acids are essential in young ruminants as in non-ruminants since they do not synthesize essential amino acids in their tissues in adequate amounts, unlike in adult ruminants where both essential and non-essential amino acids are synthesized from rumen microbial activity (McDonald *et al.*, 2002). Thus, young ruminants require optimum supply of some essential amino acids for optimum productivity. Young ruminants are reported to have a greater requirement for essential amino acids and especially those with non functional rumen (Lamboun *et al.*, 1986; Ensminger *et al.*, 1996; Chesworth, 2006). The essential amino acids necessary to achieve and sustain maximum production, defined as rapid growth, successful reproduction and heavy lactation in domestic ruminants, cannot be met solely through microbial protein synthesis (Burroughs *et al,.* 1975). Microbial growth is limited by the maximum level of fermentation which can be supported by a given diet (substrate). Obviously, complete fermentation of a substrate in the rumen can yield only a finite amount of microbial protein. Even at maximum fermentation, microbial synthesis is unable to provide sufficient quantities of amino acids to fully satisfy

the physiologic requirements for maximum productivity (genetic potential) of some particular animals in a highly productive state (e.g., rapidly growing). Maximum productivity can be achieved only by the addition of escape protein, with a favourable amino acid profile, to augment microbial protein production (Anderson *et al*., 1988). Abdelrahman and Abdelrahman (2008) indicated that supplementing amino acids will improve the bioavailability of minerals and increased growth performances of lambs. This study therefore investigated the effect of supplementing methionine on the performance of Uda lambs in a semi- arid environment of Nigeria.

Materials and Methods

Experimental Location

The research was conducted at the Usmanu Danfodiyo University Sokoto livestock Teaching and Research Farm. Sokoto is located in the Sudan savannah zone in the extreme North western part of Nigeria, and lies between latitudes 12^0 and13^0N and longitudes 4^0 and 6^0E (Mamman *et al.,* 2000). Sokoto has low humidity and high solar radiation with minimum and maximum temperatures of 13°C and 42^0C respectively reported between January and May, and a mean annual rainfall of less than 1000mm (Aregheore, 2009). Due to low humidity, Sokoto is known to be more suitable for livestock production than for any other form of agricultural activity.

Sources of experimental animals and feeds

The experimental animals were purchased from village markets around Sokoto. The animals were quarantined for two weeks. Before the commencement of the experiment, the animals were dewormed with Banmith II® (12.5mg / kg body weight) and sprayed with Triatic® against ecto-parasites. The animals were also treated against bacterial infections with oxytetracycline HCl (a broad spectrum antibiotic). Experimental feed ingredients which consisted of maize, cowpea husk, and groundnut cake (GNC), rice offal, cowpea hay, salt, bone meal, premix and methionine were purchased from *Kofar Doya* behind the Sokoto central market and bone meal was obtained from Sokoto central abattoir.

Experimental diet formulation

With different levels of methionine; the diets were Iso caloric and Iso nitrogenous. The levels of methionine in the diet were at 0 (control), 2 and 4 g/kg of diet.

Table 1: Composition of the experimental diets

Ingredients	Diet	Diet 2	Diet 3
Maize	7.00	7.00	7.00
Cowpea husk	14.50	14.50	14.50
GNC	26.04	26.04	26.04
Rice offal	22.01	22.01	22.01
Cowpea hay	26.95	26.95	26.95
Salt	0.50	0.50	0.50
Bone meal	2.50	2.50	2.50
Premix	0.50	0.50	0.50
Total	**100**	**100**	**100**
Calculated Nutrient contents			
Energy (kcal/kg)	2200	2200	2200
Protein (%)	16.00	16.00	16.00
Fiber (%)	22.67	22.67	22.67
Methionine (%)	0.03	0.03	0.03
Cost (₦)/ 100 kg	4897	4925	5009
Supplemented Methionine g/100kg)	0.00	200	400
Total methionine content (g/100kg)	3	203	403

Experimental design and dietary treatments

A completely randomized design was used in a 12-wk feeding trial this experiment with graded levels of methionine representing the treatments. A total twelve growing Uda lambs of about five months of age with an average live weight of 17 kg were used for the study. Three animals were allocated to each treatment with each animal serving as replicate. The animals were balanced for weight prior the start of the experiment. Each animal was housed in a pen measuring 2m x 1m. The experimental pens were disinfected before the start of the experiment. Each group was assigned to one of the experimental diet and fed *ad libitum* in the morning for 90 days. Water was also provided a*d libitum.*

Data Collection

The animals were weighed prior to the commencement of the experiment and weekly on the same day between 8am – 9am. Daily record of feed intake was recorded throughout the period of the trial.

Chemical Analysis

Samples of the experimental diets were analyzed for proximate component as outlined by the Association of Official Analytical Chemists (AOAC, 1990).

Statistical Analysis

The data obtained from the experiment was subjected to analysis of variance using startview Statistical Package (SAS, 2002).

Results and Discussion

Proximate composition of the experimental diets

The proximate composition of the experimental diets is shown in Table 2.

Table 2: Proximate composition of experimental diets (%)

Parameter	Treatments		
	1 (Control)	2 (2g/kg methionine)	3 (4g/kg methionine)
Dry matter (%)	95.26	95.22	95.15
Crude Protein (%)	18.00	18.11	18.15
Crude Fibre (%)	17.66	17.23	17.10
Ether Extracts (%)	6.67	6.80	6.81
NFE (%)	44.05	44.35	44.39
Ash (%)	8.88	8.73	8.70

Results indicated that Dry Matter (DM) content of the experimental diets was similar. Crude Protein content increased slightly from treatment 1 to treatment 3, while crude fibre contents decreased as the level of methionine increased (Table 2). The highest value (17.66) was recorded for treatment 1 and the least (17.10) recorded for treatment 3. The highest value (6.81) for other extracts was obtained for treatment 3 and the lowest (6.67) for treatment 1. NFE value increased from treatment 1 to treatment 3 (table 2).

The DM contents of the experimental diets are similar to those reported for most tropical feed stuffs (Aduku, 2004). The slight increase in CP contents from treatment 1 to treatment 3 could be brought by the increase in inclusion level of methionine. However, the crude protein contents of the diets were within the range recommended in small ruminants diet (Muhammad, 2011). The slight decrease in ash contents from treatment 1 to treatment 3 could be brought by the decrease in Crude Fibre contents (table 2). Crude Fibre contains high amounts of silica that might contribute to the ash contents of diets (Ademosun, 1985; Prasad, 2008).

Feed and Nutrients Intake by the experimental animals

Results on feed and nutrients intake are shown in table 3.

Table 3: Feed intake, nutrients intake and cost of feed consumed of Growing Uda Sheep Fed Diets Containing graded Levels of Methionine

Parameter	Treatments			SEM
	1 (Control)	2 (2g/kg methionine)	3 (4g/kg ethionine)	
Average feed intake (g/day)	666.67^{c}	806.33^{b}	877.67^{a}	18.4
Dry matter intake (g/day)	635.07^{c}	767.23^{b}	835.71^{a}	17.5
Crude protein intake (g/day)	120.00^{c}	140.03^{b}	159.29^{a}	3.33
Crude fibre intake (g/day)	117.73^{b}	138.93^{a}	150.08^{a}	3.18
Ether extracts intake (g/dry)	44.47^{c}	53.78^{b}	58.54^{a}	1.23
Nitrogen free extract intake g/day)	293.67^{c}	357.61^{b}	389.81^{a}	8.41
Feed Intake as % Body Weight	4.70^{b}	5.40^{a}	5.64^{a}	0.24
Cost of Feed (₦/kg)	48.97	49.61	51.53	
Cost of Feed Consumed (₦)	3264.67^{c}	4000.22^{b}	4522.62^{a}	79.34

Means in the same row with different superscripts are significantly different (P< 0.05)

From the results it could be observed that the average feed intake (TFI) was significantly highest (877.67g/day) ($P<0.05$) for treatment 3 followed by treatment 2 (806.33g/day) and then treatment 1 (666.67g/day). Daily Dry matter (DM), ether extract (EE), Nitrogen free extract (NFE) and crude protein intakes followed the same trend. However Crude Fibre (CF) Intake were comparable for treatments 2 and 3, but both were significantly higher than for treatment 1.

The average feed intake recorded for animals on treatment 2 is better than those observed for the control treatment. This could be because supplementation of methionine could improve bioavailability of minerals and increase feeding performance of lambs as observed by Abdelrahman and Abdelrahman (2008). Zhang *et al.* (2010) also reported that supplementation of methionine could improve the growth and performance of small and pseudo-ruminants.

The CPI increased because of increase in DM intake which increased as a result of the increase in methionine inclusion levels from treatment 1 to treatment 3. A similar observation was made by Muhammad *et al.* (2011). The crude fibre intake increased with increase in crude protein intake. This could be because in ruminants increased fibre content of diets does not affect intake as the animals could utilize fibre efficiently but increased protein in diets could exert significant increased in feed intake. This has also been observed by Ledin (2004), Chesworth (2006) and Muhammad *et al.* (2008). The feed intake as % Body weight increased significantly ($P<0.05$) with increase in methionine level (Table 6). The values reported for animals in this experiment is higher than those reported for Yankasa sheep by Bibi-Farouk and Osinowo (2006) and for Uda sheep by Aruwayo *et al.* (2007).This could be brought partly by increased feed intake and partly by the increase in body gain with increased in methionine level. Cost of feed consumed indicated significant difference ($P<0.05$) between all the treatments. This could be explained by the increase in cost of feed (₦/kg) and feed intake from treatment 1 to treatment 3.

Growth performance and feed utilization

Growth performance and feed utilization by the animals are presented in table 4.

Table 4: Growth performance and feed utilization of growing Uda sheep fed graded levels of methionine

Parameter	Treatments			SEM
	1 (Contro)	2 (2g/kg methionine)	3 (4g/kg ethionine)	
Initial Live Weight (kg)	16.80	16.80	17.00	0.87
Final Live Weight (kg)	19.23^{b}	23.70^{a}	22.70^{a}	0.63
Live Weight Gain (kg)	2.40^{b}	6.86^{a}	5.70^{a}	0.49
Feed Conversion Ratio	2.86^{a}	1.18^{b}	1.63^{b}	0.25
Cost Feed /kg Live Weight	1403.39^{a}	585.710^{b}	626.402^{b}	98.78

Means in the same row with different superscripts are significantly different ($P< 0.05$)

There were no significant difference (P>0.05) between the final weights of animals in treatments 2 and 3, but both were significantly higher (P<0.05) that that of the animals in treatment 1 (Table 4). Feed conversion ratio was significantly higher (2.86) (P<0.05) relative to the other two treatments which showed no significant difference. Cost of feed /kg live weight is significantly higher (₦1403/kg) (P<0.05) for treatment 1 compared to treatments 2 and 3 (₦585.7 and 626.401/kg) respectively.

The conversion ratio obtained from the present study is lower than the value reported by Abdelrahman and Abdelrahman (2008) when Awassi lambs were fed graded methionine levels. Cost of feed /kg live weight gain was higher for the control treatment because animals on the treatment had lower a feed intake and live weight gain. Results from the present study showed that the requirement for methionine by Uda lambs is higher than the value of 1.5/kg reported by Nimrick *et al.* (1974) but lower than 3g/kg recommended by Papas *et al.* (1975).

Conclusion and Recommendation

It was concluded that 2g/kg of methionine inclusion level in the diets of Uda lambs gave the optimum performance. More trials should however be conducted in order to evaluate the true feeding value of supplemental methionine.

References

Abdelrahman M.M.H and Abdelrahman M.M.H (2008).The effect of dietary yeast and protected methionine on performance and trace minerals status of growing Awassi lambs. *J. livest Sci*. 115 (2/3) 235-241.

Ademosun, A. A. (1985). Contribution of research to small ruminant production in Nigeria. In: Adu, I. F., Osinowo, O. A. Taiwo, (eds). Small Ruminant Production in Nigeria. Proceedings of National Conference on Small Ruminants Production, 6th – 10th October, NAPRI, Ahmadu Bello University, Zaria, Nigeria. Pp 18-34.

Aduku, A.O (2004). *Animal nutrition in the tropics.* Feeds and Feeding, Pasture Management, Monogastric and Ruminant nutrition. Davcon computers and Business Bereau, Kaduna, Nigeria.

Anderson, S. J., T. J. Klopfenstein, and V. A. Wilkerson. (1988). Escape protein supplementation of yearling steers grazing smooth brome pastures. *J. Anim. Sci. 66:237-242.*

AOAC (1990). Association of Official Analytical Chemist. *Official method of analysis (15th edition), Vol.1,* Arlington, Virginia, U.S.A.

Aregheore, E.M. (2009). Nigeria: Country Pasture/ Forage resource profiles. Marfel consulting (Agricultural and Educational Services). Burnaby, BC Canada. *http: // www.fao.org/ag/AGP/agpc/doc/counprof/nigeria/nigeria.htm.* cited June 13, 2010.

Aruwayo, A., S. A Maigandi. B. S Malami and A. I. Daneji (2007). Performance of lambs fed fore stomach digesta and poultry litter

waste. *Nig. J. Basic Appl. Sci., 15 (1-2): 86-93.*

Bibi-Farouk, F. and A. O. Osinowo (2006). Feed intake and weight gain of Yankasa ewes fed fresh *Ficus thoningii* Leaves In: *(Muhammad, I.R., B.F. Muhammad., F. Bibi-farouk and Y. Shehu eds) Application of Appropriate Technology in Over Coming Environmental Barriers in Animal Agriculture in Nigeria.*Proceedings of the 31st Annual Conference of Nigeria Society for Animal Production 12-15 March. pp 413 - 416.

Burroughs, W., D. K Nelson, and D. R. Mertens. (1975). Evaluation of protein nutrition by metabolizable protein and urea fermentation potential. *J. Dairy Sci. 58:611-619.*

Chesworth, J. (2006). *The Tropical Agriculturalists, (Ruminant Nutrition).* Technical Centre for Agricultural and Rural Cooperation. CTA Wageningen, Netherlands. Macmillan Publishers, Oxford. 179pp

Ensminger, M. E.; J. E. Oldfield and W. N. Heinemann (1996). *Feeds and Nutrition* (3rd edition). Clovis C. A: Ensminger Publishing Company. Engle woods, Califonia, USA. pp123 -366

Lambourn, A.K., A.K. Mosi and M.H. Butterworth (1986). Relationship between chemical composition and voluntary intake of feeds by sheep and cattle. In: *DeRidder, N., H. Van Keulen., N.G. Seligman and P.T.H. Neate (eds). Proceedings of the ILCA / ARO / CABO Workshop held at ARO, Bet Dagan. Israel. 5-9 Febuary.*

Ledin I. (2004). Energy and Protein requirements of small ruminants. Swedish University of Agricultural Sciences. Swedish University Press, Uppsala, Sweden. *www. mekarn. org/ procss/ledin.pdften,* cited July 2nd, 2008.

Mamman, A.B, Ojebanji, J.O and S.W. Peters (2000). (eds) *Nigeria A people United, A future Assumed* (survey of states). (V.1.2) Gabumo publishing Co-ltd. Calabar, Nigeria.

McDonald. P. R. A. Edward, J.F. D Green Halgh and C. A Morgan (2002). *Animal Nutrition (7th edition).* Pearson education Ltd, Essex, London. 693pp.

Muhammad N. (2011). Evaluation of different energy and protein levels in the diet of growing and fattening sheep in a semi-arid environment. Ph.D. Thesis, Usmanu Danfodiyo University, Sokoto, Nigeria.

Muhammad, N., H. M. Tukur, S. A. Maigandi and A. I. Daneji (2011). Nutrients intake and Digestability of growing Uda sheep fed diets containing different protein levels. *Journal of Biological and Environmental Science* 8(4): 84-89.

Muhammad, N., S. A. Maigandi; W.A Hassan and A. I. Daneji (2008). Growth performance and economics of sheep production with varying levels of rice milling waste. *Sok. J. Vet. Sci. 7(1):59-64*

Nimrick, K; Hatfield, E.E; Kaminski J and F.N. Owens (1974). Quantiative assessment of supplemental amino acid needs for growing lambs fed

urea as the sole nitrogen source. *J. Nutr., 100:1301-1306.*

Papas A.G.A.B; Hatfield, E.E and F.N. Owens (1975). Response of lambs to oral or abomasal supplementation of methionine; *hydroxyl analog or methionine. J. Nutr., 104:653-659*

Prasad J. (2008). *Principles and Practices of Animal Nutrition.* Kalyani Publishers, New Delhi.

Rhanjan, S. K (2004). *Animal Nutrition in the Tropics (5th revised edition).* Vikas publishing House. PVT. Ltd. India. 377pp

SAS (2002). Startview Statistical Package (English Version). Statistical Analysis System, *SAS Inc.* New York.

Zhang, Y. C. and Li, F. C. (2010) Effect of Dietary Methionine on Growth Performance and Insulin-like Growth Factor. -1m RNA expression of Growing meat Rabbits. *Journal of Animal Physiology and Animal Nutrition. 94:* 803-808.